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CIRCULAR No. 1003.

06-21-06

A LITTLE LIGHT ON THE SUBJECT.



GENERATORS
AND
MOTORS ..

HOW
And WHERE ...
MADE.

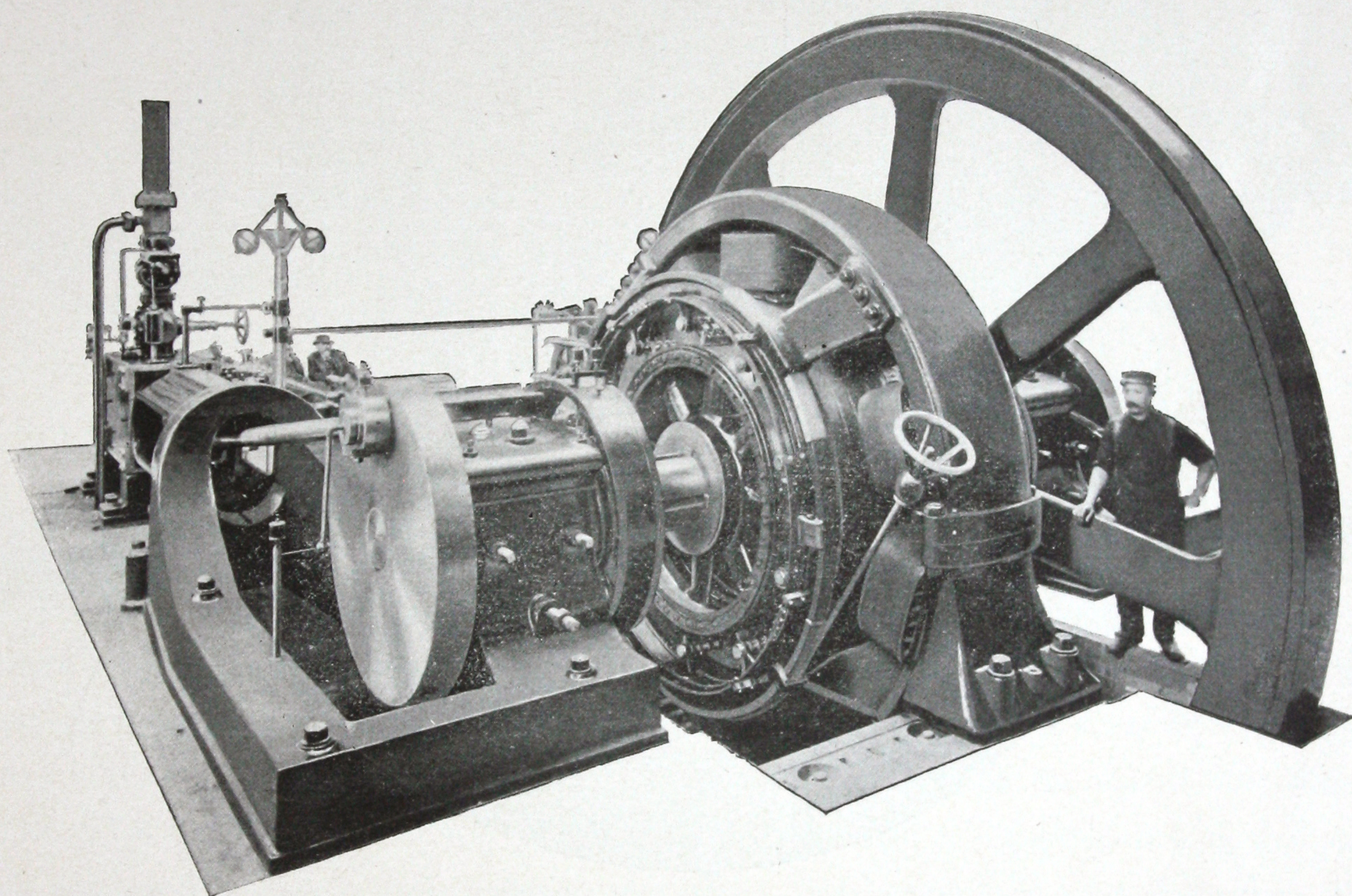
FRANKLIN ELECTRIC
MACHINE CO.

FRANKLIN INSTITUTE
PHILADELPHIA

Walker Company,

CLEVELAND, OHIO, U. S. A.

Railway and Power Generators.



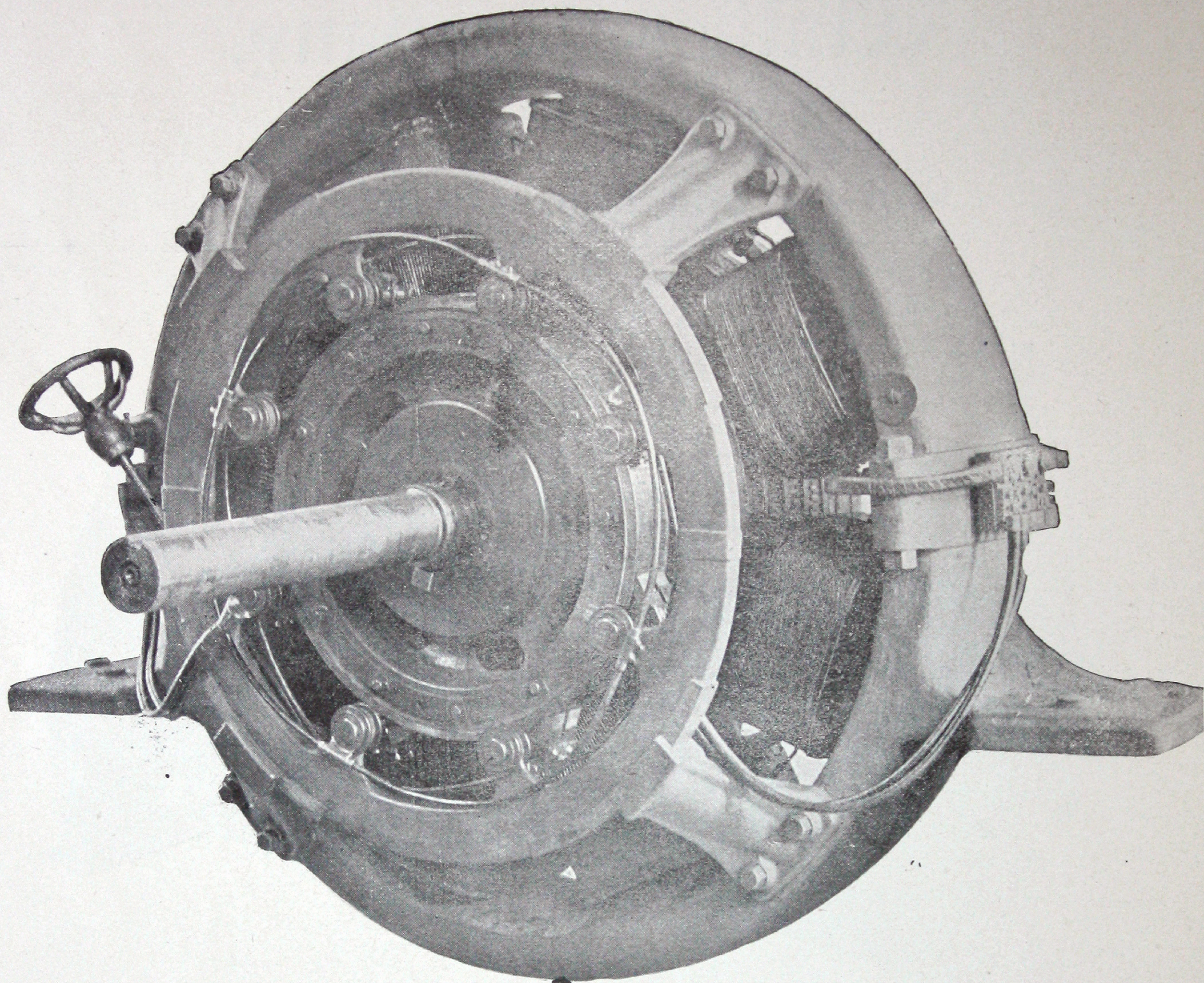
200, 300, 400, 800, 1,200, 1,500 K. W. Generators.



ONLY a few years ago the state of electrical engineering in general, and of dynamo design in particular, was such that any and all apparatus designed for commercial use was universally looked upon with suspicion, as being something untried and experimental. And this was so with good reason, since electric and magnetic phenomena were little understood, and in consequence the design of machinery based thereon depended upon the use of empirical rules and formulæ deduced from imperfect theories and experiments. Progress, however, has been very rapid, and to-day the magnetic and electrical principles underlying the construction of electrical machinery, particularly of the direct current type, are so well understood that apparatus of this class can now be turned out with an even greater degree of precision than is possible in many other much older lines of engineering.

In placing upon the market a line of direct current generators, especially designed with a view to the very exacting requirements of railway work, it has been the aim of the Walker Company to avoid as fully as possible the introduction of novelties and untried features, and to produce a type of machine which should combine all the long-tried and well-proven elements of dynamo-electric machinery that the best engineering experience could suggest. It is confidently believed that this aim has been accomplished and embodied in the apparatus illustrated in the following pages.

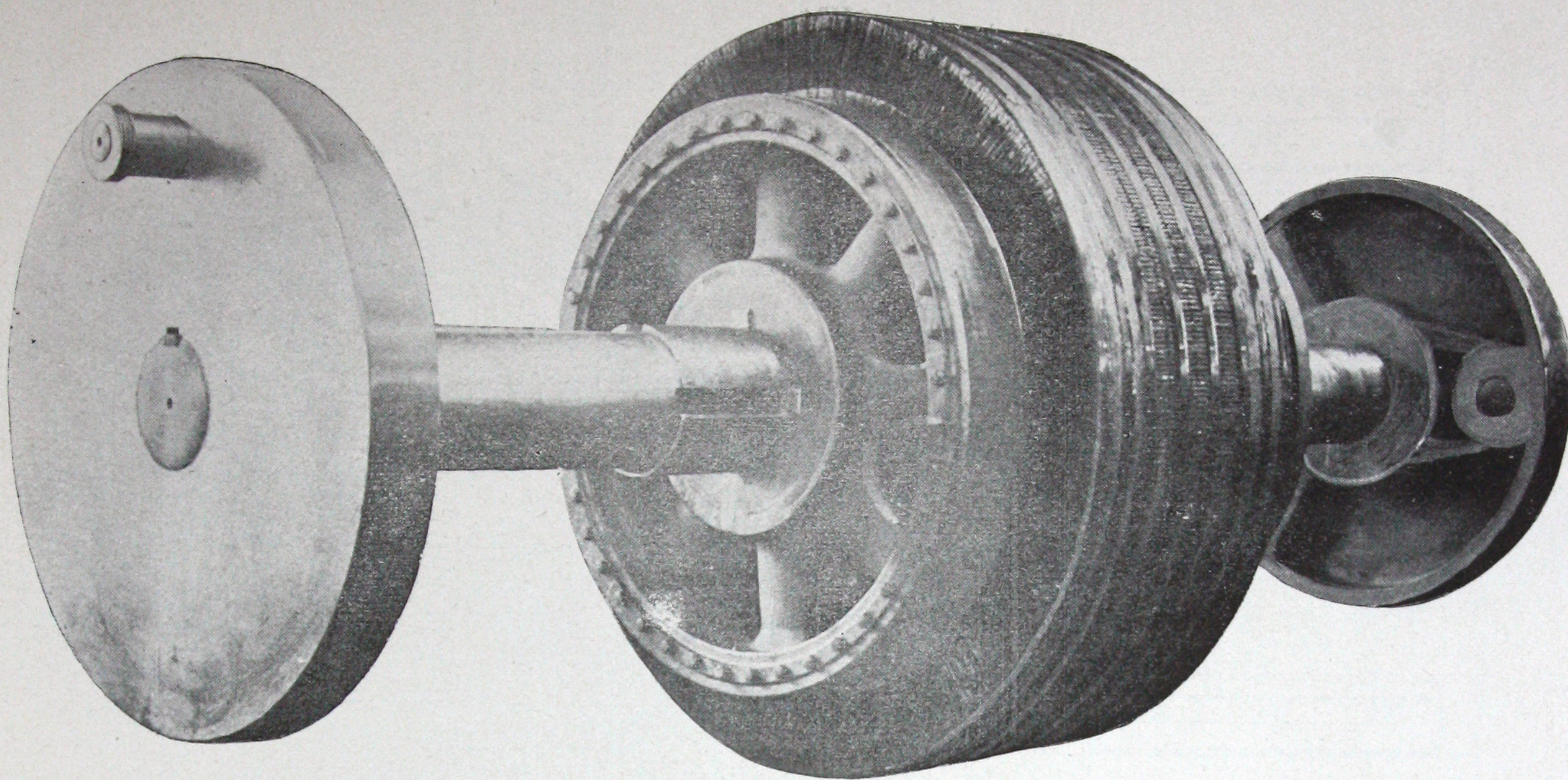
10 90-B5940 TCF



Direct Connected Railway or Power Generator.

THE WALKER COMPANY some years since entered the field as a builder of large sized generators, of which some views are presented herewith.

The magnet yoke is of cast iron. This material is considered by the makers to be superior to steel for this purpose, since, on account of the greater section required (the section being more than twice that of a steel yoke), a very much greater rigidity is obtained. The poles are of soft iron, laminated, and cast into the yoke. They have pole shoes of cast steel, which serve also to keep the magnet spools in position. The yoke ring rests upon broad feet at each side securely bolted to heavy cast-iron girder plates. These girders are extended to such distance that the yoke may be slid along in a direction parallel to the shaft sufficiently to be entirely clear of the armature, thus allowing complete accessibility to either the magnet coils or armature. The girders are laid in concrete and cement upon massive capstones, and are secured by heavy bolts passing down through the foundation.

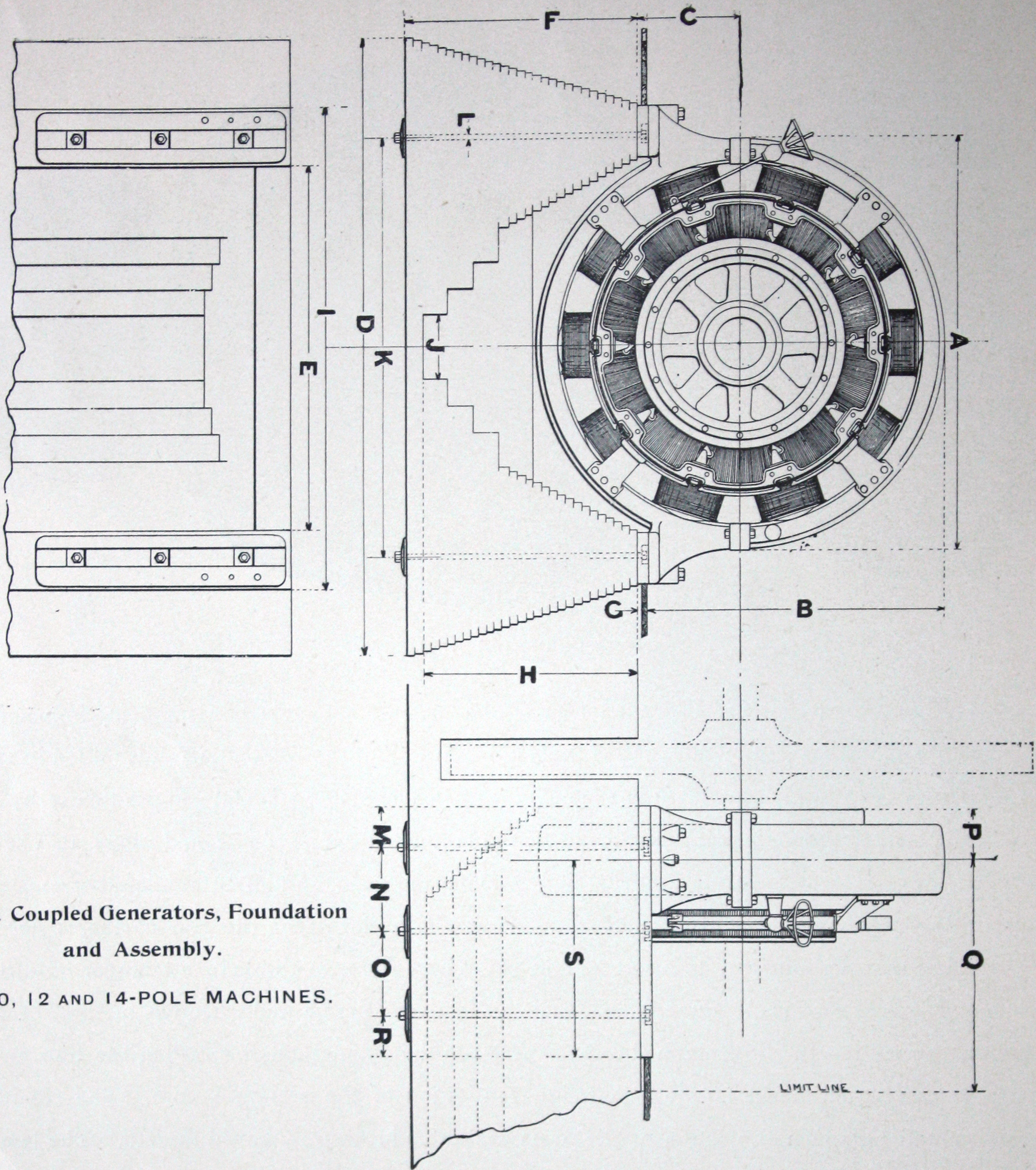


Direct Connected Armature.

The armatures are of the iron clad type. The plates are punched in segments from soft, well annealed iron, and are secured by dove-tailed projections fitted into corresponding slots milled in the rim of the spider. This detail is illustrated in the engravings. The plates are held longitudinally by heavy end rings, the fastening bolts passing just inside of the laminated core. These end rings also serve as supports for the portion of the armature winding outside of the slots. An important detail of construction is shown in the engraving of the armature spider. It will be noticed that the rim of the spider is not made solid, but that the arms end in a sort of T head. This is done to eliminate all danger of shrinkage strains, and it will be obvious to any engineer that this is a very simple and effective method of accomplishing the desired result. It is claimed to be superior to the old method of splitting the hub and, furthermore, gives a better chance for more thorough ventilation of the armature core. The commutator spider is mounted upon a projection of the armature hub and securely keyed thereto. The laminated core is divided into a number of sections separated by one-half inch air spaces, allowing an ample circulation of air.

The armature winding consists of flat copper ribbon formed into proper shape previous to assembling, and being entirely without joint except at the commutator leads. The coils are very thoroughly insulated, and are held in place by phosphor-bronze bands.

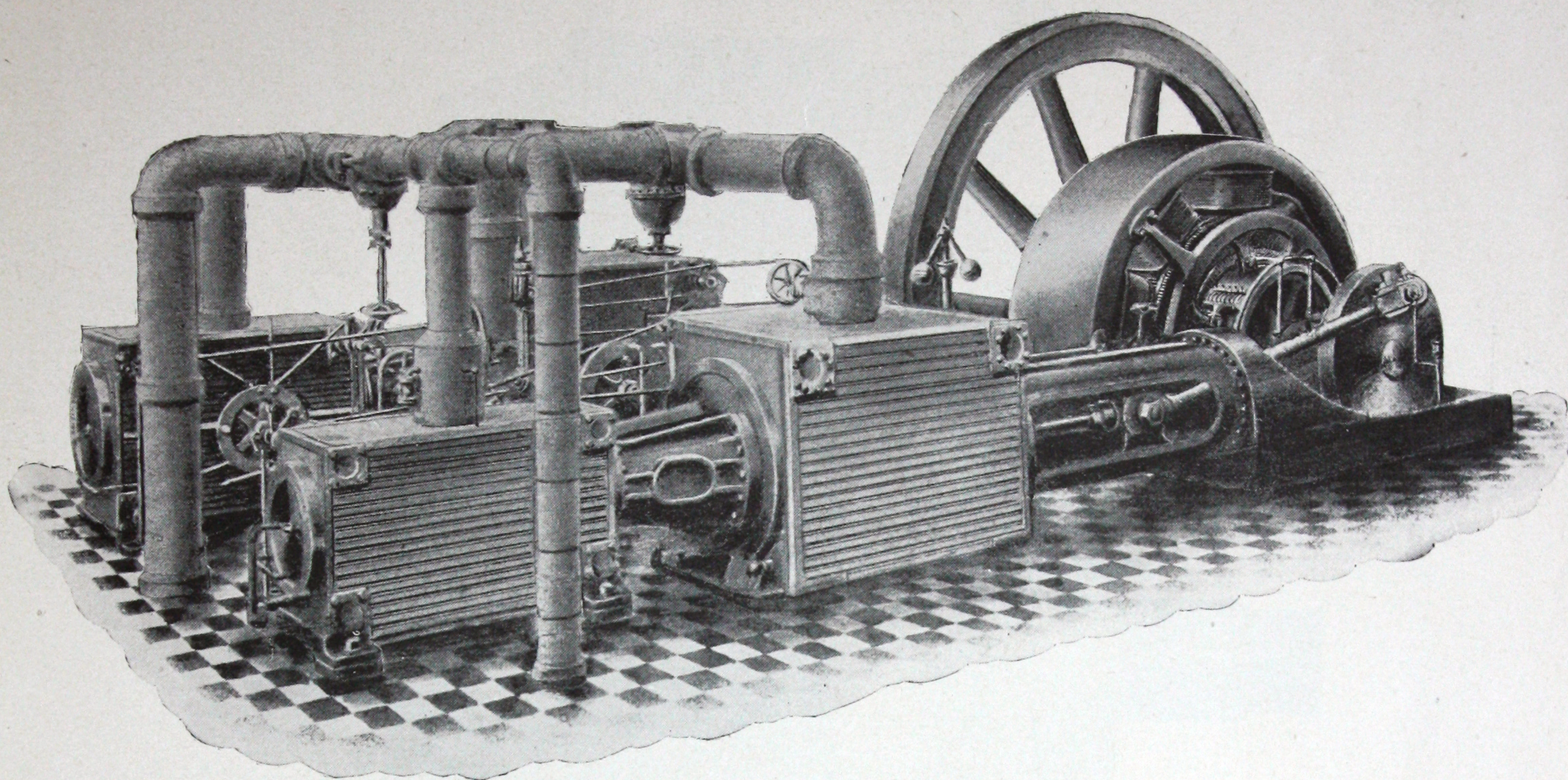
The construction of the commutator is shown in the illustrations. The bars are held in place by a sectional clamp, so designed as to draw the bars firmly down on to the flat cylindrical surface of the spider. The leads are both riveted and soldered to the bars and are made long and flexible. The current density in the carbon brushes at full load is a little less than thirty-five amperes per square inch.



Direct Coupled Generators, Foundation
and Assembly.

8, 10, 12 AND 14-POLE MACHINES.

K. W.	100	150	175	200	200	200	250	300	300	400	400	500	800	800	1000	1200	1600
HP	135	200	235	270	270	270	335	400	400	536	535	670	1070	1070	1350	1600	2150
SPEED	125	200	225	100	150	200	200	300	90	120	90	110	85	80	80	80	75
WEIGHT	23600	23600	23600	54000	46000	58000	65000	58000	82000	82000	98000	98000	180000	188000	.....	.....	.....
A	91 $\frac{3}{4}$	91 $\frac{3}{4}$	91 $\frac{3}{4}$	105 $\frac{1}{2}$	97 $\frac{1}{2}$	92 $\frac{1}{2}$	110	92 $\frac{1}{2}$	141 $\frac{3}{4}$	141 $\frac{3}{4}$	146 $\frac{3}{4}$	143 $\frac{3}{4}$	166	166	193	193	219
B	72 $\frac{1}{4}$	72 $\frac{1}{4}$	72 $\frac{1}{4}$	85	81	66 $\frac{7}{8}$	72	66 $\frac{7}{8}$	102 $\frac{3}{8}$	102 $\frac{3}{8}$	107 $\frac{1}{2}$	107 $\frac{1}{2}$	121	121	146 $\frac{1}{2}$	146 $\frac{1}{2}$	157 $\frac{1}{2}$
C	30	30	30	36	36	30	36	30	37	37	39 $\frac{1}{2}$	39 $\frac{1}{2}$	43 $\frac{1}{2}$	43 $\frac{1}{2}$	58	58	56
D	162	162	162	170	162	168	187	168	216	216	216	216	236	236	276	276	286
E	71	71	71	81	68 $\frac{1}{2}$	78	85	78	121	121	125	125	142	142	168	168	192
F (Min.)	84	84	84	84	84	90	93	90	96	96	96	96	96	96	108	108	108
G	8 $\frac{1}{2}$	3 $\frac{1}{2}$	3 $\frac{1}{2}$	3 $\frac{1}{2}$	3 $\frac{1}{2}$	9	9	9	5	5	5	5	5	5	7 $\frac{1}{2}$	7 $\frac{1}{2}$	7 $\frac{1}{2}$
H	72	72	72	72	72	78	83	78	84	84	84	84	84	84	96	96	96
I	107	107	107	129	116	120	140	120	175	175	175	175	195	195	228	228	268
J	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
K	88	88	88	103 $\frac{1}{2}$	88	94	102	94	144	144	147	147	165 $\frac{1}{2}$	165 $\frac{1}{2}$	188	188	218
L	1 $\frac{3}{4}$	1 $\frac{3}{4}$	1 $\frac{3}{4}$	1 $\frac{3}{4}$	1 $\frac{3}{4}$	2	2	2	2 $\frac{1}{4}$	2 $\frac{1}{4}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$
M	7	7	7	10	.....	6	.....	6	13 $\frac{3}{4}$	13 $\frac{3}{4}$	14	14	14	14	12	8 $\frac{1}{2}$	18
N	20	20	20	25	.....	19 $\frac{1}{2}$	24	19 $\frac{1}{2}$	27 $\frac{1}{2}$	27 $\frac{1}{2}$	28	28	32 $\frac{1}{2}$	32 $\frac{1}{2}$	22	26	27
O	20	20	20	25	.....	.....	.....	.....	27 $\frac{1}{2}$	27 $\frac{1}{2}$	28	28	32 $\frac{1}{2}$	32 $\frac{1}{2}$	22+22	26+26	27+27
P	11	11	11	15 $\frac{1}{2}$	13 $\frac{3}{4}$	13 $\frac{3}{4}$	16	13 $\frac{3}{4}$	18	18	18 $\frac{1}{4}$	18 $\frac{1}{4}$	20	21	21	23	26
Q	18 $\frac{3}{4}$	18 $\frac{3}{4}$	18 $\frac{3}{4}$	21 $\frac{1}{4}$	19 $\frac{1}{2}$	29	29	29	29	29	30 $\frac{1}{4}$	30 $\frac{1}{4}$	35 $\frac{3}{4}$	36 $\frac{3}{4}$	40	43 $\frac{1}{2}$	46
R	7	7	7	10	.....	6	10	6	13 $\frac{3}{4}$	13 $\frac{3}{4}$	14	14	14	14	12	8 $\frac{1}{2}$	18
S	42	42	42	53	.....	15 $\frac{3}{4}$	20	15 $\frac{3}{4}$	63	63	64	64	71 $\frac{1}{2}$	71 $\frac{1}{2}$	70	70	92



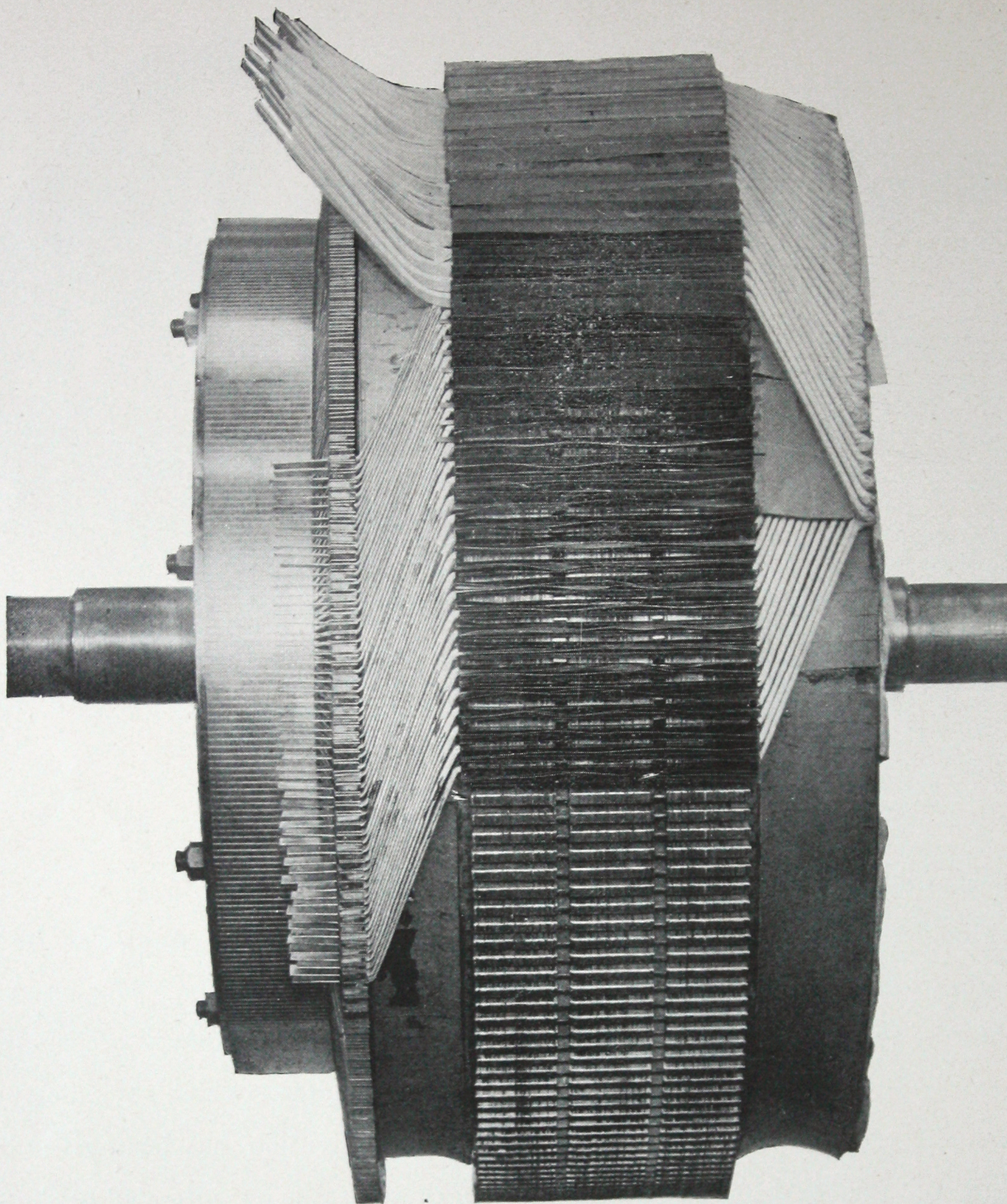
Direct Coupled Generator.

The shaft is of forged steel.

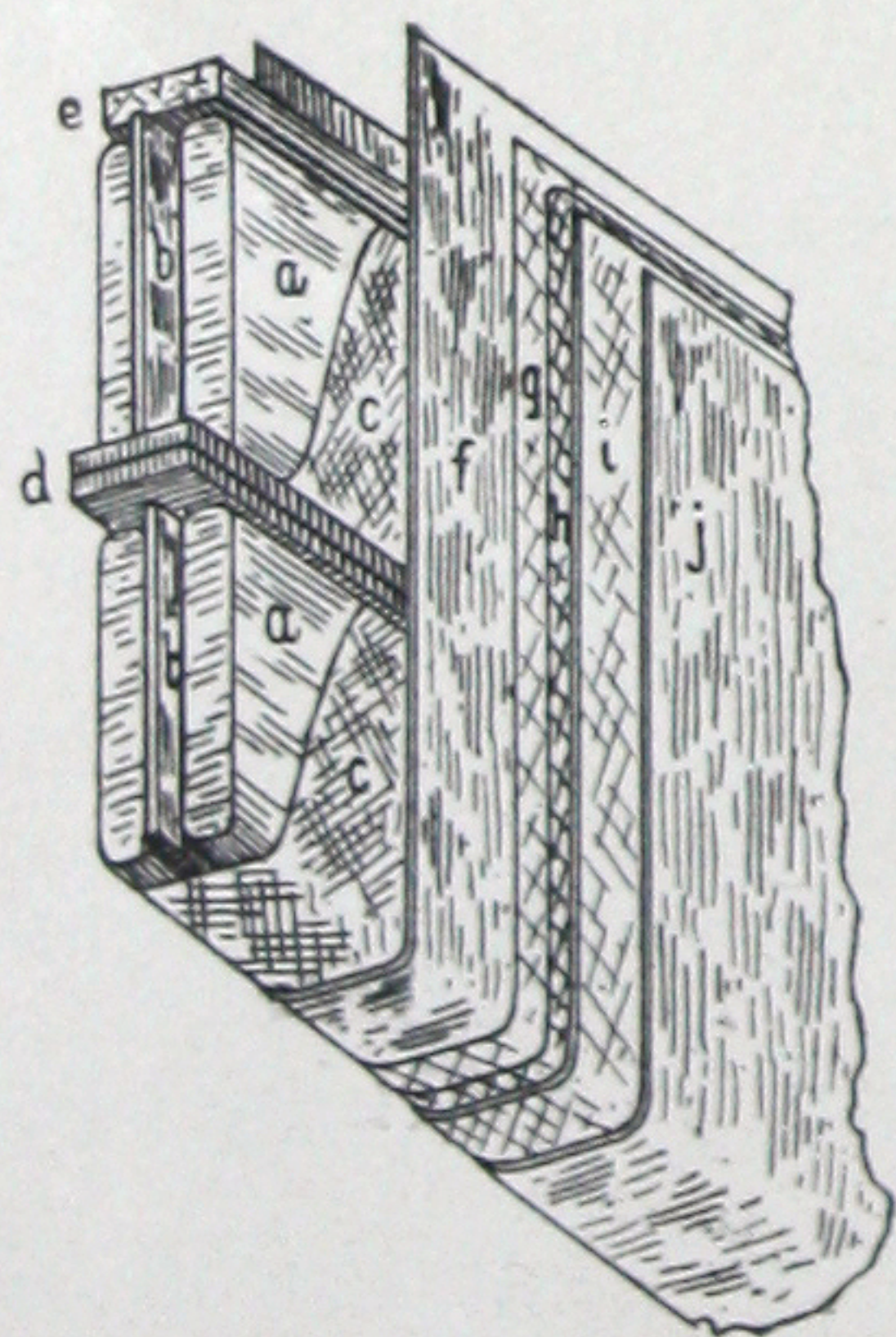
The brush holders are novel in design in that the carbon is clamped solidly in the holder, giving the current a low resistance path from brush to stud with no sliding contacts. The brush has a parallel movement, so that there is no rocking motion of the carbon when the commutator is slightly out of true.

It has been the aim of the manufacturers to produce a generator which should stand up to the exacting requirements of railway service with ease. Particular attention has been given to the details of mechanical design, and the illustrations given of some of these details are intended to show how this has been effectively accomplished.

A special study has been made of the question of non-sparking operation, and it has been the aim to so design these generators that without any brush shifting the non-sparking limit will be between fifty and seventy-five per cent. overload. The practical operation of the generators has given results that are all that could be anticipated. As an illustration, it was necessary recently when two 400 k. w. machines and one 800 k. w. were carrying the load to shut down for a short time the 800, throwing the whole load, which happened to be 3,000 amperes, on to the two 400 k. w. generators. They carried this overload of 100 p. c. for the time required without the least difficulty and with only a slight sign of sparking, there being no shifting of the brushes. This illustration is given merely as an example of what the Walker generators are able to stand up to in case of emergency.

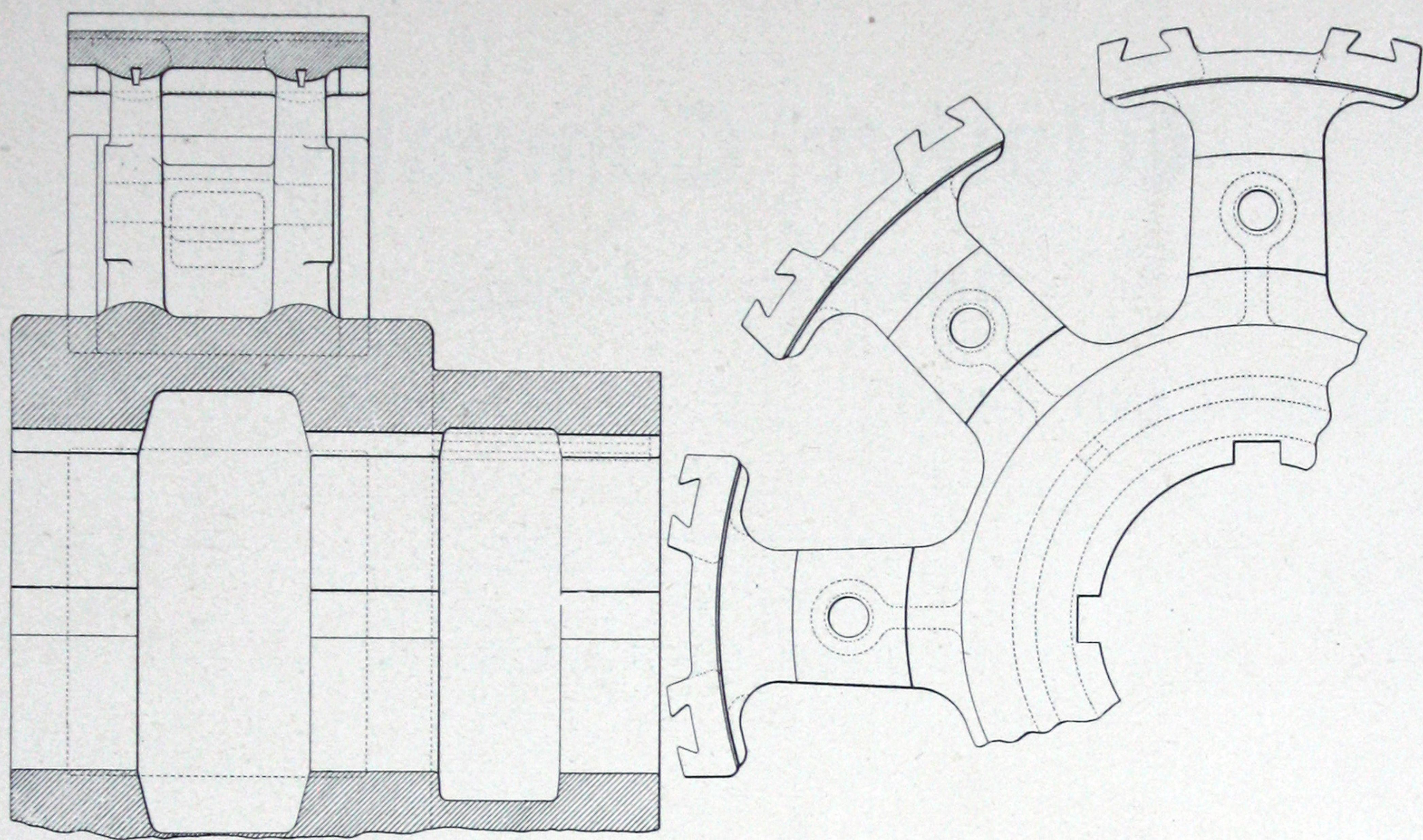


Armature partly wound, showing method of insulating Conductors.

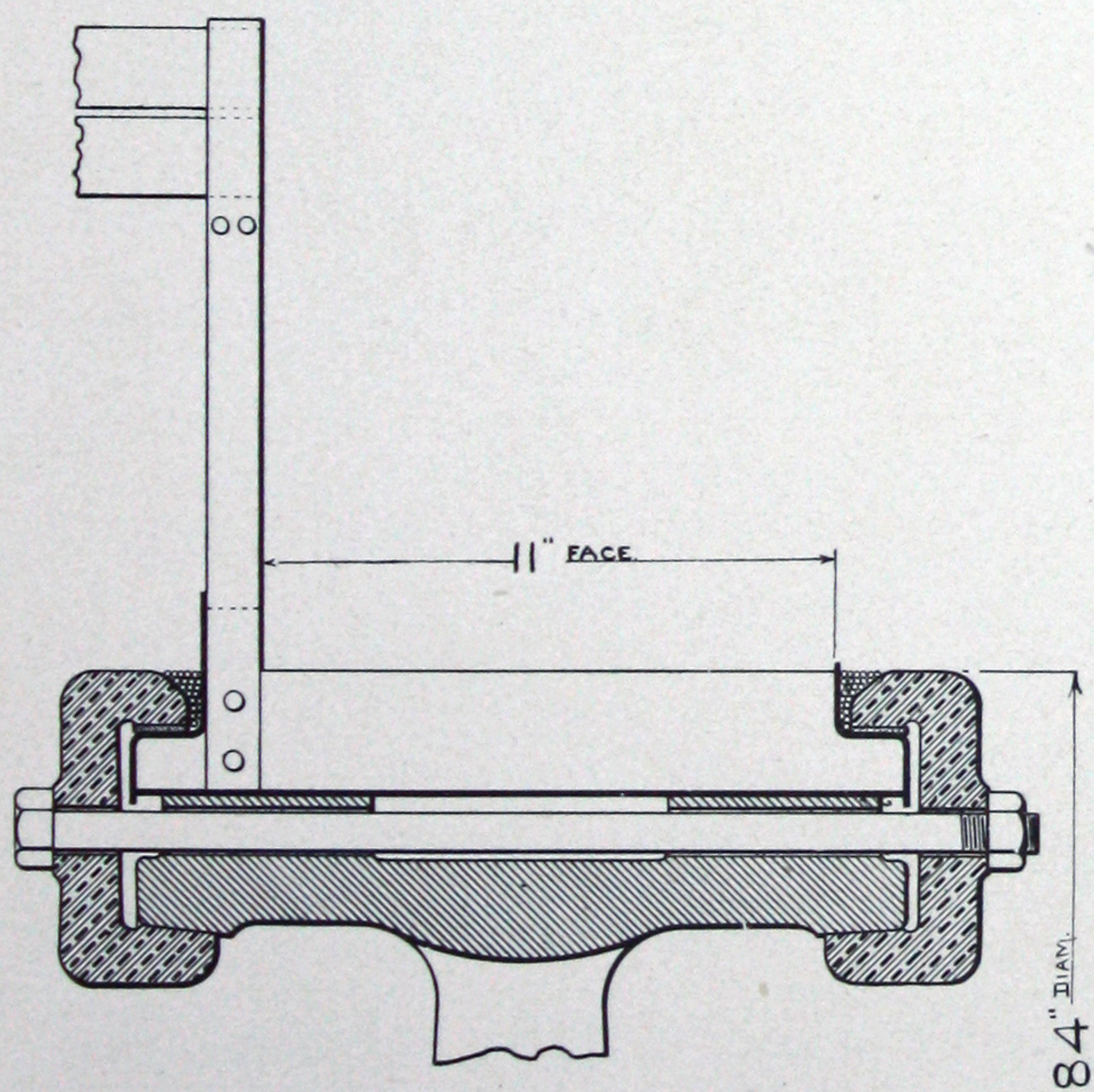


- a—Conductor.
- b—Fuller board strip between conductors.
- c—Linen tape.
- d—Composite strip between top and bottom conductors.
- e—Hardwood strip closing top of slot.
- f—Fuller board trough.
- g—Trough of oiled paper.
- h—Trough of mica.
- i—Trough of oiled linen.
- j—Fuller board trough.

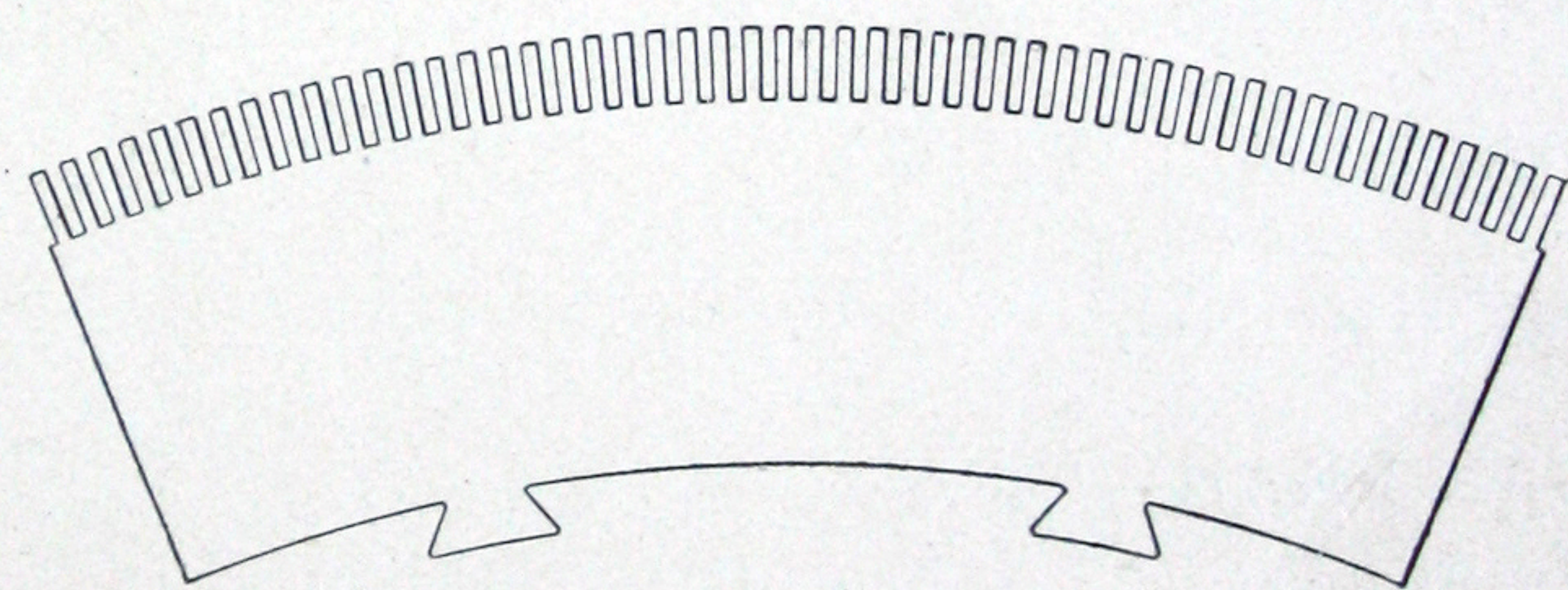
Method of Insulating Conductors in Walker Armature.



Half Section and Side Elevation of Armature Spider.



Half Section of Commutator.



Disc Segment of Armature.

Walker Company,

Main Office and Works,

CLEVELAND, OHIO,

=

=

U. S. A.

SALES OFFICES.

NEW YORK, 913-914 Postal Telegraph Building.

BOSTON, 8 Oliver Street.

PHILADELPHIA, 1120 Betz Building.

PITTSBURGH, 1012 Carnegie Building.

CHICAGO, 1645-6-7-8 Monadnock Block.

MINNEAPOLIS, 470-475 Syndicate Arcade.

ST. LOUIS, 715-717 North 2nd Street.

DALLAS, 310 Trust Building.

RICHMOND, Ebel Building.

SAN FRANCISCO, 13-15 Fremont Street.

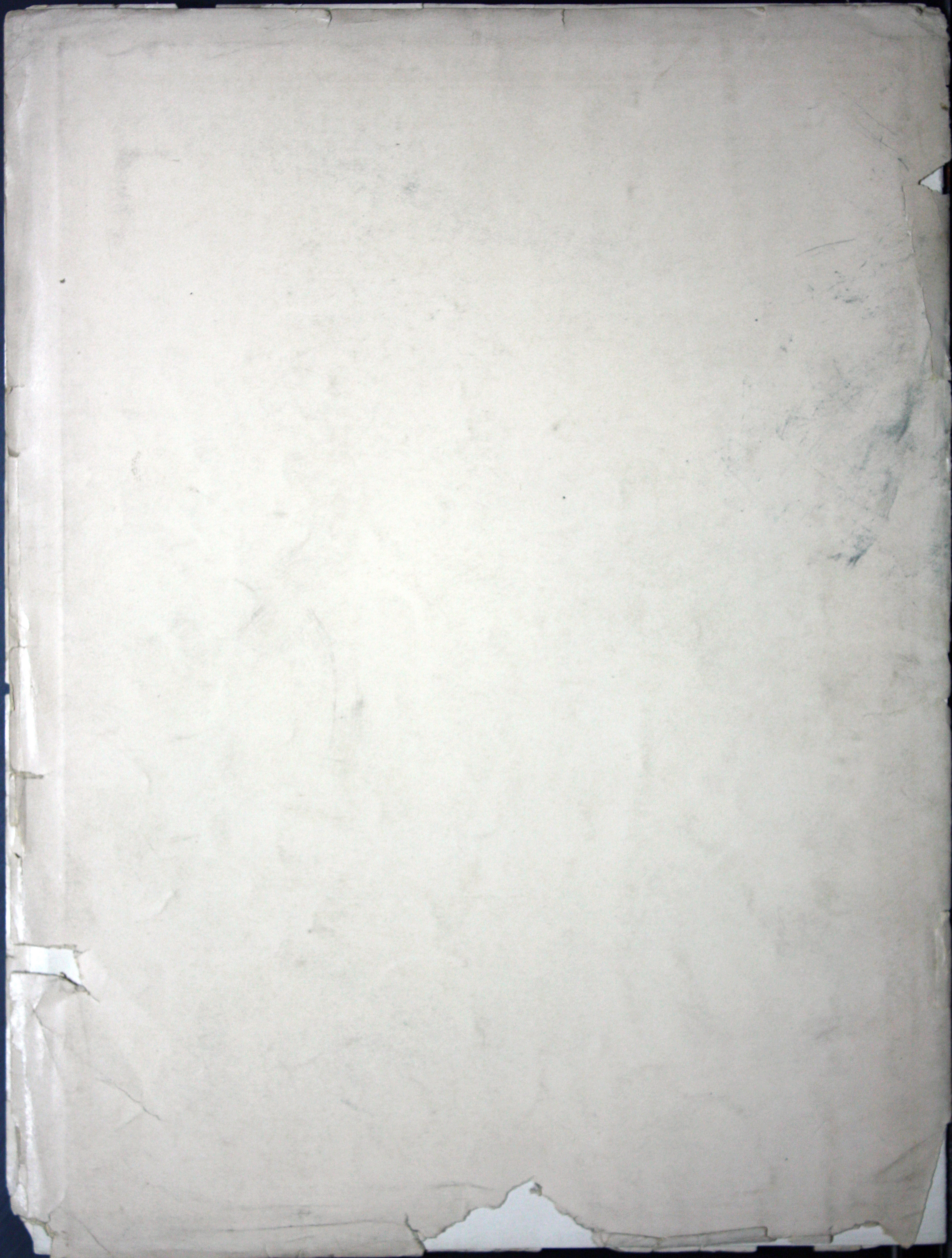
EUROPEAN COUNTRIES AND NORTH AFRICAN STATES,

Represented by Exploitation Des Procedes Electriques Walker, J. Laveissiere, President,

. 6 Rue Boudreau, Paris, France.

CHINESE AND JAPANESE EMPIRES, represented by Bagnall & Hilles, Yokohama, Japan.





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